

CLAIM(S)

WE CLAIM:

1. A piezoelectrically actuated microvalve operable to affect the flow of a fluid upon application of a voltage from a voltage source, the microvalve comprising;

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a valve body having a first end and a second end, the valve body including an elongated flow channel formed therein and extending substantially longitudinally between the first and second ends to permit substantially longitudinal flow of the fluid therethrough and between the first and second ends; and

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a deflectable member disposed on the valve body, the deflectable member including at least a first piezoelectric portion that is piezoelectrically operable to deflect the deflectable member between an open position and a closed position

upon the application of a voltage, the deflectable member in the closed position being operable to resist the flow of the fluid through the flow channel.

5 2. The microvalve of claim 1, wherein the deflectable member includes a second piezoelectric portion that is cooperable with the first piezoelectric portion to deflect the deflectable member between the open and closed positions

10 3. The microvalve of claim 2, wherein the deflectable member includes an intermediate layer interposed between the first and second piezoelectric portions.

 4. The microvalve of claim 3, wherein the intermediate layer is formed from brass.

15 5. The microvalve of claim 1, wherein the valve body includes a cavity formed therein, at least a portion of the deflectable member being disposed in the cavity.

 6. The microvalve of claim 5, wherein the deflectable member includes a fixed end and a free end, the fixed end being secured to the valve body; and
 the deflectable member including a gate disposed at the free end, at least a
20 portion of the gate being receivable in the flow channel to resist the flow of the fluid through the flow channel when the deflectable member is in the closed position.

25 7. The microvalve of claim 6, wherein the valve body includes a first wafer, a second wafer, and a third wafer; deflectable member includes a fixed end and a free end; the chamber? (cavity) being disposed substantially between the first and second wafers; and the flow channel being disposed substantially between the second and third wafers.

30 8. The microvalve of claim 7, wherein the second wafer includes an opening formed therein; and at least a portion of the gate being receivable in the opening.

9. The microvalve of claim 8, wherein the second wafer includes a port formed therein, the port providing fluid communication between the flow channel and the chamber.
- 5 10. The microvalve of claim 1, wherein the microvalve is stackable upon another similar microvalve.
11. The microvalve of claim 1, wherein the microvalve is structured to be used in a low voltage application.
- 10 12. The microvalve of claim 1, wherein the microvalve is structured to resist degradation by hydrogen gas.
13. The microvalve of claim 1, wherein the deflectable member is deflectable in a substantially linear manner in response to a voltage applied thereto.
- 15 14. The microvalve of claim 1, wherein the first end and second end of the valve body are opposite one another.
- 20 15. The microvalve of claim 6, wherein the fixed end and the free end of the deflectable member are opposite one another.
16. A fuel cell operable with a quantity of fuel and a quantity of an oxidizer to produce electrical power, the fuel cell comprising:
- 25 a fuel cell body including a labyrinth system structured to permit the fuel and the oxidizer to flow therethrough;
- at least a first catalyst in fluid communication with the labyrinth; and
- at least a first microvalve operably disposed within at least a portion of the labyrinth;
- 30 wherein the first microvalve includes a valve body, and deflectable member operable upon the application of a voltage from a voltage source;
- a valve body having a first end and a second end, the valve body including an elongated flow channel formed therein and extending substantially longitudinally

between the first and second ends to permit substantially longitudinal flow of the fluid therethrough and between the first and second ends; and

5 the deflatable member disposed on the valve body, the deflatable member including at least a first piezoelectric portion that is piezoelectrically operable to deflect the deflatable member between an open position and a closed position upon the application of a voltage, the deflatable member in the closed position being operable to resist the flow of the fluid through the flow channel.

10 17. The fuel cell of claim 16, wherein the deflatable member includes a second piezoelectric portion that is cooperable with the first piezoelectric portion to deflect the deflatable member between the open and closed positions.

15 18. The fuel cell of claim 17, wherein the deflatable member includes an intermediate layer interposed between the first and second piezoelectric portions.

19. The fuel cell of claim 16, wherein the deflatable member includes an intermediate layer is formed from brass.

20 20. The fuel cell of claim 16, wherein the valve body includes a cavity formed therein, at least a portion of the deflatable member being disposed in the cavity.

21 The fuel cell of claim 16, wherein the deflatable member includes a fixed end and a free end, the fixed end being secured to the valve body; and
25 the deflatable member including a gate disposed at the free end, at least a portion of the gate being receivable in the flow channel to resist the flow of the fluid through the flow channel when the deflatable member is in the closed position.

30 22 The fuel cell of claim 21, wherein wherein the valve body includes a first wafer, a second wafer, and a third wafer; deflatable member includes a fixed end and a free end; the cavity being disposed substantially between the first and second wafers; and the flow channel being disposed substantially between the second and third wafers.

23. The fuel cell of claim 22, wherein the second wafer includes an opening formed therein; and at least a portion of the gate being receivable in the opening.

5 24. The fuel cell of claim 23, wherein the second wafer includes a port formed therein, the port providing fluid communication between the flow channel and the cavity.

25. The fuel cell of claim 16, wherein the first and second ends of the valve body are opposite one another.

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26 The fuel cell of claim 16 wherein the fixed end and the free end of the deflectable member are opposite one another.